German Patent No. DE 197 34 843 A1

Translated from German by the Ralph McElroy Translation Company
910 West Avenue, Austin, Texas 78701 USA

Code: 2099-75207

FEDERAL REPUBLIC OF GERMANY
GERMAN PATENT OFFICE
PATENT NO. DE 197 34 843 A1
(Offenlegungschrift)

Int. Cl.[6] :	B 60 S 1/38
Filing No.:	197 34 843.2
Filing Date:	August 12, 1997
Date Laid Open to Public Inspection:	February 18, 1999

WIPER BLADE FOR MOTOR VEHICLE WINDSHIELDS

Inventors: Wilfried Merkel
77876 Kappelrodeck, DE

Wolfgang Leutsch
77830 Bühlertal, DE

Thomas Schmidt
Tienen, BE

Thomas Kotlarski
77830 Bühlertal, DE

Applicant: Robert Bosch GmbH,
70469 Stuttgart, DE

The following information has been extracted from the documentation submitted by the applicant.

A wiper blade (10) is proposed that serves to clean motor vehicle windshields. The wiper blade features an elongated elastic wiper strip (14) that can be positioned flush on the windshield to be wiped, and that is essentially attached to the side facing the windshield of a band-shaped spring-elastic support element (12) which is connected by a driven wiper arm that can be under a spring pressure force acting in a direction perpendicular to the longitudinal extension of the wiper blade. Pressing the wiper blade against the windshield with the high pressure required to

achieve a clean wiping field in compliance with regulations can be achieved even at high driving speeds if the wiper blade is equipped with an air shield surface (44 or 144) that faces the wind blast (arrow 46), against which the wind blast flows, which extends in the longitudinal direction of the wiper blade essentially parallel with the windshield and which, viewed in a direction perpendicular to its longitudinal extension, forms a steep angle (α) with the windshield.

Description

State of the art

In wiper blades of the type characterized in the generic part of Claim 1, the support element is supposed to guarantee the most even possible distribution of the wiper blade pressure against the windshield exerted by the wiper over the entire wiping area wiped by the wiper blade. By way of the appropriate curvature of the support element while it is not under load – i.e. when the wiper blade does not sit flush against the windshield – the ends of the wiper strip that, during operation of the wiper blade, are pressed completely flush against the windshield, are being put under pressure by the support element in the direction toward the windshield. The support element is then under tension even if the curvature radii of spherically curved windshields differ with each position of the wiper blade. Accordingly, the curvature of the wiper blade must be somewhat stronger than the strongest curvature measured in the wiping area of the windshield to be wiped. In this manner, the support element replaces the complicated support-yoke construction by the spring rails contained in the wiper strip as they are used in conventional wiper blades (DE-OS 15 05 397).

The invention is based on a wiper blade according to the generic type of Claim 1. In a known wiper blade of this type (DE-PS 12 47 161), on the one hand, the wind blast can blow underneath the wiper blade or rather underneath its support element on that side of it that faces the wind blast since, due to the pressure distribution in its center section, the support element protrudes far above the wiper strip, allowing the wind to build up an overpressure. On the other hand, due to the aforementioned design, a significant relative vacuum develops on the side that faces away from the wind blast. While the wiper blade that conducts a reciprocating motion during its operation constantly changes its position in relation to the oncoming wind blast, one of its longitudinal sides faces still the wind blast more or less directly at any time, which is why it is called the front side; its other side accordingly being called the back side. Through the combined effect of these two aforementioned pressures that both counteract the pressure of the wiper blade against the windshield, the wiper blade pressure against the windshield is diminished to the point where proper and effective wiping is no longer possible, at least not at higher driving speeds. Increasing the pressure of the wiper blade against the windshield may reduce this problem at high driving speeds; however, at slower driving speeds at which the tendency of the wiper to lift

off the windshield is reduced, increasing the pressure of the wiper blade against the windshield will increase friction between the wiper blade and the windshield generating undesirable noise and causing unacceptable high stress on the drive components and on the wiper strips.

Advantages of the invention

In the wiper blade according to the characteristics of Claim 1, a force component is built up that is directed toward the windshield by means of an air shield surface that faces the wind blast and that counteracts the lift tendency caused by the two pressures, and in this manner provides an excellent cleaning quality, at least in the area wiped over by the wiper blade that is important to the driver. Depending on the size of the air shield surface and/or on the angle of incidence α, this auxiliary pressure that pushes the wiper against the windshield can be adjusted to requirements set by the type of vehicle. It is a further advantage of the solution, according to the invention, that the pressure exerted upon the wiper in the direction of the windshield increases or decreases as a function of the driving speed. Consequently, a proportionately sized "auxiliary pressure" on the wiper toward the windshield counteracts the annoying tendency of the wiper to lift off from the windshield that occurs at higher speeds.

From DE-OS 15 05 397 it is known to attach a lateral flanking surface to a wiper blade at an inclination to the windshield that faces the wind blast; however, the wiper blade mentioned there is fitted with the aforementioned yoke support system that forces a high installation height, thus facilitating the tendency to lift off. This yoke support system, together with the spring rails positioned in the wiper strip, forms the support element of the wiper blade on which the wiper strip is retained.

A particularly simple and low-cost realization of the air shield surface results if it is positioned on the wiper strip.

A further simplification is achieved, in particular with respect to the production of the wiper strip, if the wiper strip with a socket crosses the support element in a plane perpendicular to the windshield, and if the air shield surface is configured on the elongated socket parallel to the longitudinal axis of the support element.

This can be advantageously accomplished by form-fitting the socket to the wiping strip of the wiper strip or by extrusion-fitting the socket to the wiping strip of the wiper strip.

The flexibility of the wiper strip with regard to a plane perpendicular to the windshield is not [at all] or only insignificantly degraded if the socket is made from material that is softer than the material of the wiping strip. Under certain circumstances it can also be advantageous to make the socket out of harder material in order to enhance the stability of the wiper blade.

For particularly problematic windshield configurations, it can be useful if the air shield surface is configured to feature a cross-sectional shape with a concave curvature.

Advantages for assembly result if the support element is configured to consist of multiple parts.

An easy-to-manufacture solution of a multi-part support element is achieved by configuring it in the shape of a hair needle with its two parallel needle-shaped arms connected to each other at one of their ends by a link by which they form one single piece.

To secure the hair-needle-shaped support element to the wiper strip, the other ends of the needle-shaped arms that face away from the link are connected to each other by means of a bracket.

Further advantageous developments and embodiments of the invention are presented in the following description of two embodiment samples that are shown in the pertinent drawings.

Drawings

The figures of the drawing show:

Figure 1, a side view of a wiper blade according to the invention;

Figure 2, a bird's eye view of the wiper blade according to Figure 1;

Figure 3, a detail cross-sectional view of a first embodiment of a wiper strip as part of the wiper blade along the line III-III in Figure 1;

Figure 4, a cross-sectional view according to Figure 3 of a different embodiment of the wiper blades; and,

Figure 5, a bird's eye shortened detail view of a support element that is part of the wiper blade.

Description of the embodiment sample

A wiper blade 10 shown in Figures 1 and 2 features a multi-part, elongated, spring-elastic support element 12 on which an elongated strip-elastic wiper strip 14 is attached in a direction that is parallel to the longitudinal axis. On the top side of the support element a connecting device 16 is positioned by means of which the wiper blade 10 can be detachably connected with a driven wiper arm 18. To the free end 20 of the wiper arm 18, a hook is form-fitted that serves as a counter-connecting device and grabs around a joint stud 22 that is part of the connecting device 16 of the wiper blade. The connection between the wiper arm 18 and the wiper blade 10 is secured by known securing devices, configured as adapters, and not more closely shown here. The wiper arm 18, and also with it the hook at the end of the arm 20, is pressurized in the direction of the arrow 24 toward the windshield to be wiped. The surface that is to be wiped is indicated in Figure 1 as a dashed and dotted line 26. Since the dashed and dotted line 26 is supposed to indicate the strongest curvature of the windshield surface, it is clear to see that the curvature of the wiper blade 10 that touches the windshield with both of its ends is stronger than

the maximum curvature of the windshield. Under the pressure toward the windshield (arrow 24), the wiper blade with its wiping lip 28 rests flush against the windshield surface 26 over its entire length. In this process, a tension develops within the band-shaped, spring-elastic support element 12 that guarantees proper contact with the motor vehicle windshield of the wiper strip 14, or rather the wiping lip 28, over its entire length.

Below, the special embodiment of the wiper blade, in particular of the wiper strip 14 shall be discussed in greater detail. In the embodiment variant of the invention according to Figure 3, the wiper strip 14 consists of a base body 30 to which the wiping lip 28, that rests upon the surface 26 of the windshield, is form-fitted via a so-called flip-link 32. The base body 30 together with the flip-link 32 and the wiping lip 28 forms a so-called wiping strip 34 that has the same cross-sectional shape over its entire length. On the side of the base body 30 that faces away from the wiping lip 28, a socket 36 that consists of a softer material than the wiping strip 34 is connected to the base body 30. The connection is made by means of a relatively narrow connecting link 38 of the socket 36 that is positioned between two longitudinal open-edge grooves 40 and 42 which are positioned opposite of each other. Above the two longitudinal grooves 40 and 42, i.e., where the socket extends to the width of the base body 30 again, on the side that faces away from the windshield surface 26, an air shield surface 44 is configured which, as is shown here in a cross-sectional view, has a concave curvature that faces the wind blast (arrow 46). The forward edge 48 of the socket 36 or of the air shield surface 44, viewed in the direction of the wind blast (arrow 46), lies closer to the windshield surface 26 to be wiped than the rearward edge 50 in relation to the wind blast. Consequently, a connecting line between the two edges 48 and 50 to the surface 26 of the windshield forms a steep angle of approximately 35°, which bears the designation α in Figure 4. In the embodiment variant according to Figure 3, the various areas 28, 32, 30, 38 and 36 are manufactured to form one single piece, preferably extruded. The air shield surface 44 in the frontal area features an angle of inclination of approximately 10°, and in the rearward area [an angle] of approximately 70°.

In the embodiment variant in Figure 4, the basic design of the wiper blade 114 is shaped identically to the structure of the wiper blade 14 according to Figure 3. For this reason, in Figure 4 the same reference numbers are used for the wiping lip 28, the base body 30, and the flip-link 32, as in Figure 3. In contrast to the wiper strip 14, according to Figure 3, the socket 136 of the wiper strip 114 consists of a material that differs from that of the wiping strip 134. On the wiper strip 114, according to Figure 4, the entire socket 136 with a connecting link 138 extends to the base body 30 and is there permanently attached to the top side of the base body 30 that faces away from the surface 26 of the windshield. This can be accomplished by way of so-called multi-material extrusion in which, in this case, the two separate areas 136 and 134 of the wiper strip 114 are extruded separately and joined together immediately after the extrusion, thus

forming an integral connection between the socket, or rather its connecting link 38, and the base body 30. In this case as well, due to the height of the connecting link 38, two longitudinal grooves 140 and 142 result that are positioned opposite each other, as the width of the connecting link 138 is significantly less than the width of the socket 136. Additionally, Figure 4 illustrates that the socket 136, on the side of the socket that faces away from the surface 26 of the windshield, features a roof-like down-angled air shield surface 144 which, viewed perpendicular to its longitudinal extension, forms a steep angle α with the windshield. This air shield surface 144 faces the wind blast (arrow 46).

The connection between the wiper strip 14 or 114 and the support element 12 is explained below based on Figure 5. The support element 12 is configured to consist of two parts in the embodiment sample. Its main part has the shape of a hair needle. Accordingly, it features two needle-like arms 52 that are parallel to and distanced from each other, one of the ends of each of which are connected to each other by means of a connecting link 54 forming one single piece. This hair-needle-shaped main part 52, 54 forms the support element proper 12. In order to stabilize the free ends of the arms 52, these are connected to each other by a bracket 56 in the manner of a bridge. This guarantees good stability for the support element 12. The connection between the ends of the arms 52 and the bracket 56 is accomplished through spot-welding in the areas 58, since in the embodiment sample the support element 12 with its individual sections 52, 54, 56 is made from a spring steel band. However, conceivably, the entire support element and its individual parts could be manufactured from an elastic plastic material. The distance between the two arms 52 corresponds to the width of the connecting link 38 of the wiper strips 14 and 114. For assembly, the hair-needle-shaped support element 12 is inserted with its two arms 52 in a longitudinal direction into the longitudinal grooves 40, 42 of the wiper strip 14 with the bracket 56 not yet attached. This assembly position is indicated in Figures 3 and 4 by a dashed and dotted line. The insertion process is completed when the link 54 abuts flush against the head side 60 of the connecting link 38. In this position, the free ends of the arms 52 still protrude beyond the other head side 62 of the connecting link 38, thus providing assembly surfaces for the bracket 56 and space for mounting areas 58.

As Figures 2-4 show, the support element 12 is somewhat wider in its center section than the wiper strip 14 with its socket 36 and 136, and in this manner provides space for the attachment of the connecting device 16.

Both embodiment samples have in common that the wiper blade 10 features an air shield surface 44 or 144 that extends in a longitudinal direction and essentially parallel to the windshield, that faces the wind blast (arrow 46) and that, viewed in a direction perpendicular to its longitudinal extension, forms a steep angle α that ranges between 10 and 70°.

For the explanation of the function of the wiper blade according to the invention, reference is made to Figure 3. During the operation of the wiper blade, the operating motion of which is indicated by the double arrow 64, when it is moved across the surface 26 of the windshield with its wiper strip 14, the support element 12 is positioned in a plane that extends essentially parallel to the surface 26 of the windshield. During this action, the wiper blade 10 is pressed against the windshield (arrow 24 in Figure 1) by a pressure force that is counteracted during the operation of the wiper blade, in particular at high driving speeds, by a lift tendency that acts in the direction of the arrow 66. Since the air shield surface 44 and 144 of the wiper strip 14 and 114 faces the wind blast 46 forming a steep angle α, the pressure of the wind blast 46 generates a force component that in Figures 3 and 4 has been symbolized by the arrow 68. This force component 68 counteracts the lift tendency (arrow 66), and thus maintains the pressure by which the wiper blade presses (arrow 24) against the windshield within the required range.

Claims

1. Wiper blade (10) for motor vehicle windshields with an elongated, rubber-elastic wiper strip (14), which is positioned essentially parallel to the longitudinal axis of the surface facing the windshield of a band-shaped, spring-elastic support element (12) that is connected with a wiper arm (18) that is driven perpendicular to the longitudinal extension of the wiper blade and can be pressure-loaded in a direction toward the windshield, characterized in that the wiper blade (10) features an air shield surface (44 or 144) that extends longitudinally essentially parallel to the windshield and faces the wind blast (46), and that forms a steep angle (α) with the windshield viewed perpendicular to its longitudinal extension.

2. Wiper blade according to Claim 1, characterized in that the air shield surface (44 or 144) is positioned on the wiper strip (14).

3. Wiper blade according to one of Claims 1 or 2, characterized in that the wiper strip (14 or 114) with a socket (36 or 136) crosses the support element in a plane perpendicular to the windshield, and in that the air shield surface (44 or 144) is formed on the elongated socket that is parallel to the longitudinal axis of the support element (14).

4. Wiper blade according to Claim 3, characterized in that the socket (36 or 136) is form-fitted to a wiping strip of the wiper strip (14 or 114).

5. Wiper blade according to Claim 4, characterized in that the socket (136) is extruded onto the wiping strip (34) of the wiper strip (114).

6. Wiper blade according to one of the Claims 3-5, characterized in that the socket (136) consists of a material that is different from that of the wiping strip (34).

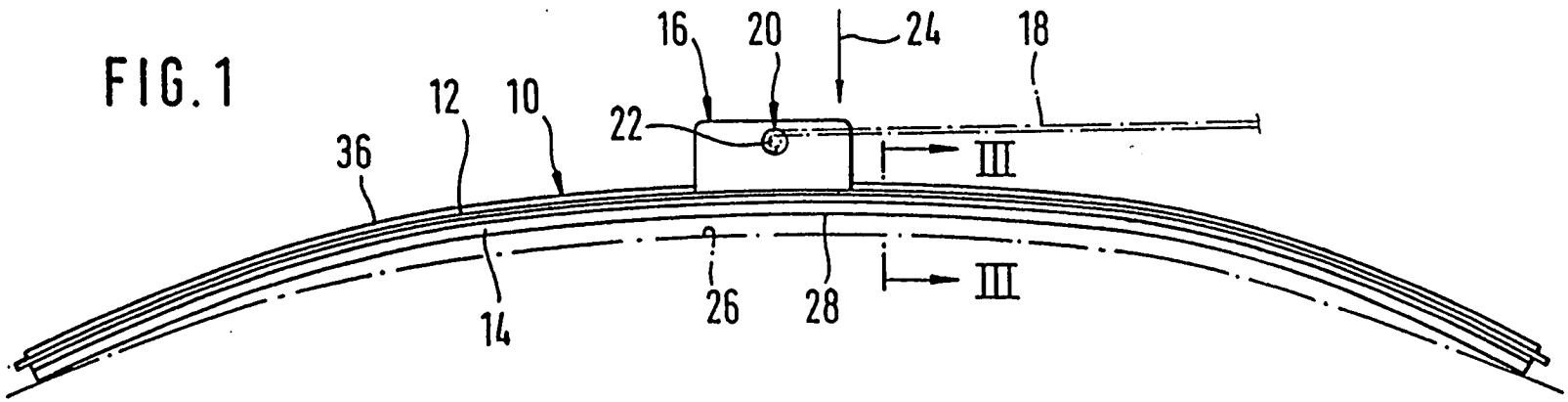
7. Wiper blade according to one of Claims 1-6, characterized in that the cross-sectional shape of the air shield surface (44) is a concave curvature facing the wind blast (46).

8. Wiper blade according to one of Claims 1-7, characterized in that the support element (12) is configured to consist of several individual parts.

9. Wiper blade according to one of Claims 1-8, characterized in that the support element (12) is hair-needle-shaped with its two parallel needle-shaped arms (52) connected by a link (54) to form one single piece.

10. Wiper blade according to Claim 9, characterized in that the ends of the needle-shaped arms (52) that face away from the link (54) are connected to each other by a bracket (56).

FIG. 1



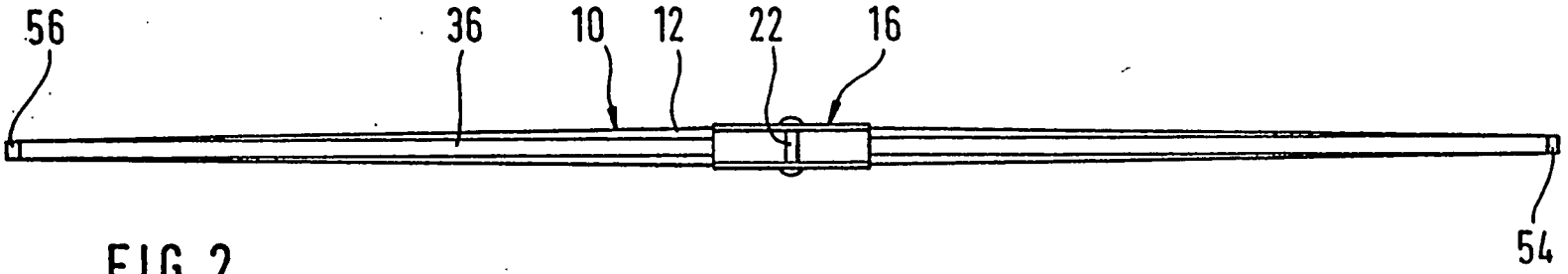


FIG. 2

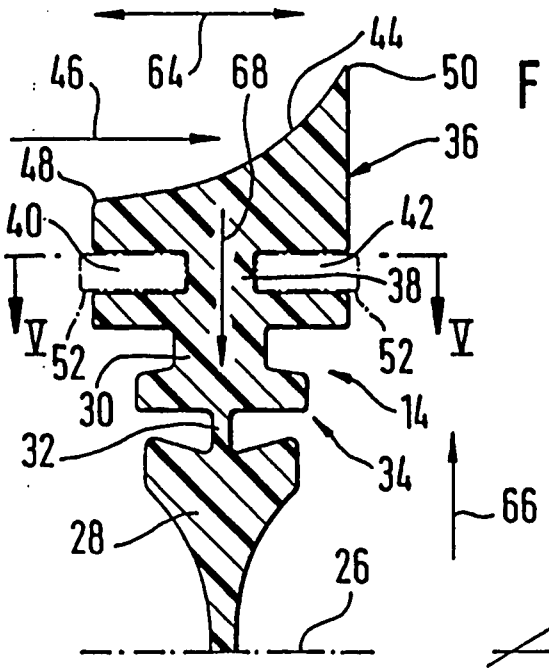


FIG. 3

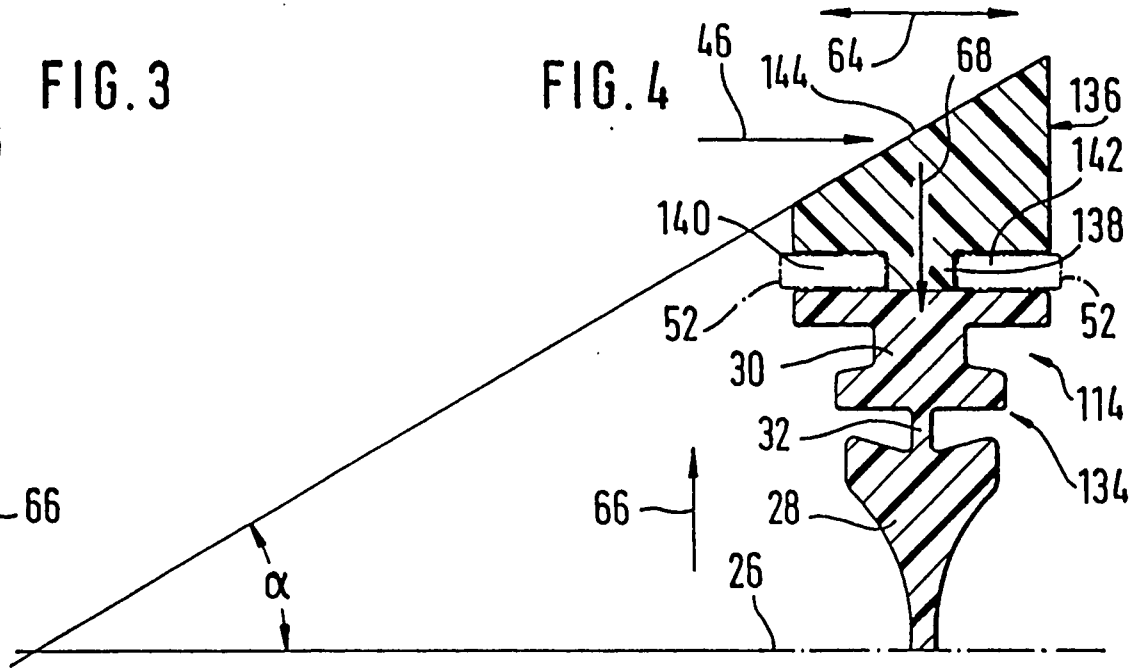


FIG. 4

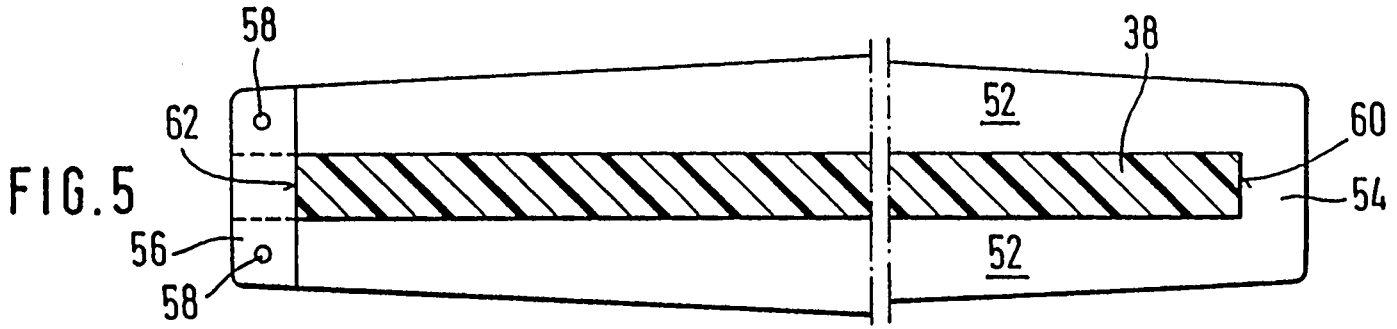
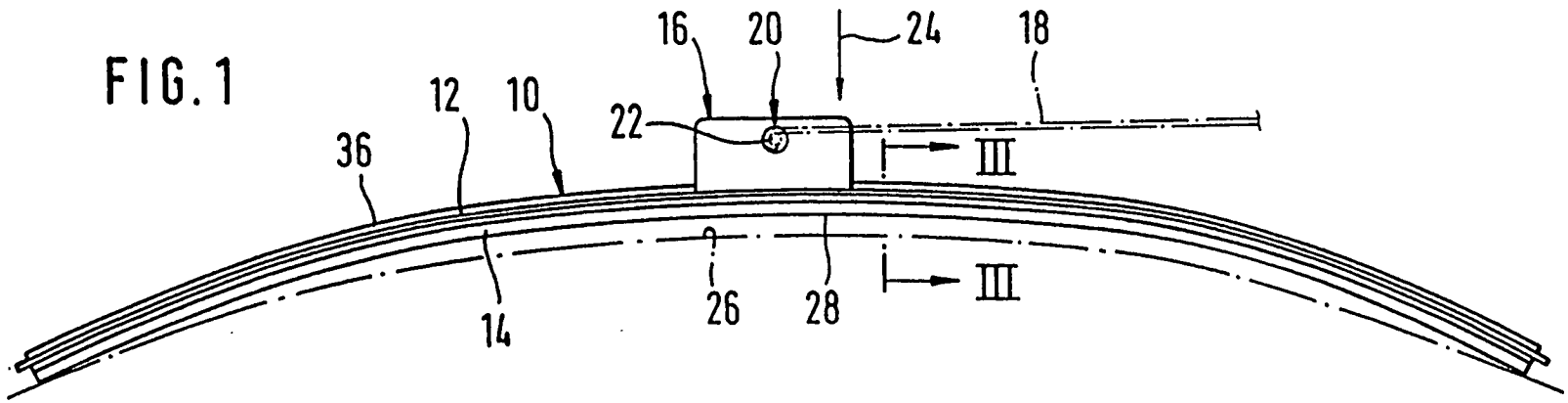


FIG. 5

FIG. 1



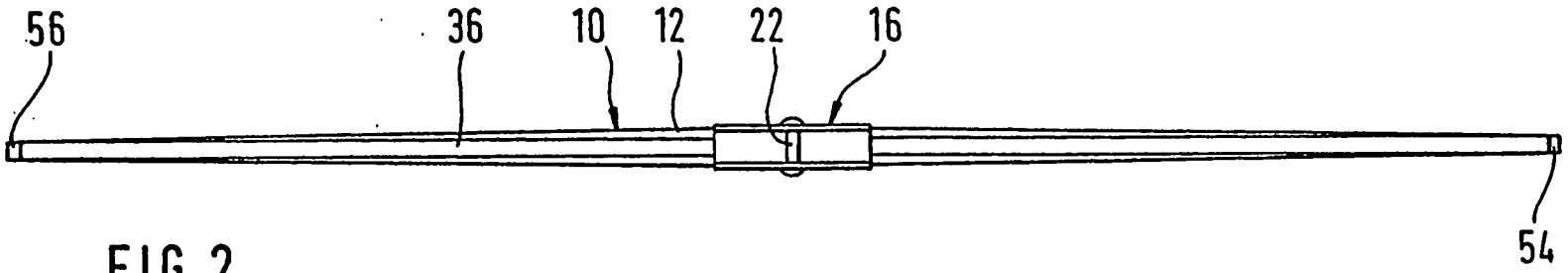


FIG. 2